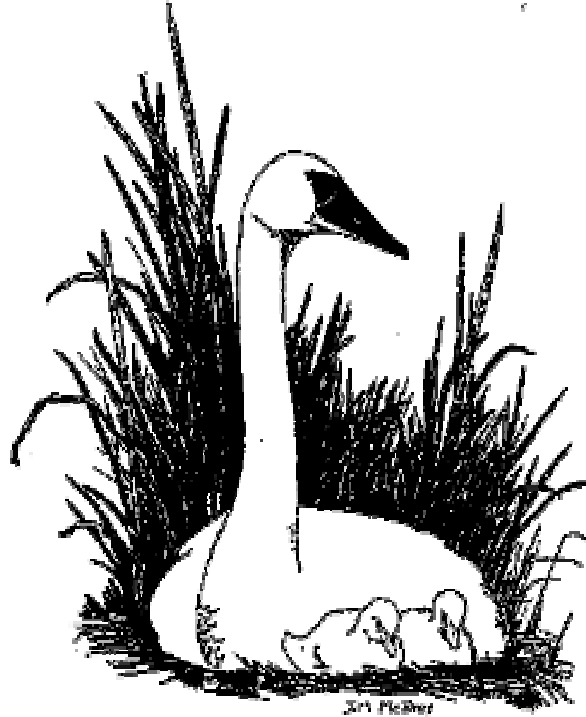


*Conservation Assessment
For
Trumpeter Swan (Cygnus buccinator)*



USDA Forest Service, Eastern Region

December 18, 2002

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This Conservation Assessment was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

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EXECUTIVE SUMMARY

The following is a draft conservation assessment providing a summary of readily available information on the distribution, ecology, habitat and population biology of the trumpeter swan (*Cygnus buccinator*) in the Great Lakes region.

The trumpeter swan is a classic conservation success story. With less than 70 known swans remaining in the world, this species was believed to be nearing extinction in the 1930s (Hansen 1973). This belief led to the beginning of a number of conservation and management programs which protected the critical habitat of this species and enabled the small population in the Yellowstone region to increase in abundance. Later, a large population of trumpeter swans was discovered in Alaska and Canada, revealing that this species was not as critically imperiled as once believed. Once the stabilization and growth of the Yellowstone population was certain, efforts became focused on reestablishing populations in the Midwest, part of the historic range of this bird. Trumpeter swan recovery programs have been carried out in many midwestern states, including Minnesota, Michigan, and Wisconsin. Success has been widespread with the programs' goals of self-sustaining natural populations having been established in each of these states. The abundance of this species, however, is still much smaller than it once was and as a result, the species is listed as threatened or endangered in many states.

The greatest threat that exists for the trumpeter swan is the lack of adequate winter habitat and the fact that many of the restored populations have not established migratory behaviors. The result of the lack of winter habitat is a dense concentration of swans in a few isolated areas, which leaves this species vulnerable to a single catastrophic event, lack of food, and the spread of disease. Some programs are now attempting to encourage migration among certain populations.

NatureServe (2001) outlined three major research needs: 1. To gather information on gene flow between populations; 2. Determine nutritional requirements of different age and sex classes as well as determine the differences in foraging ecology and nutritional needs between migratory and sedentary populations; and 3. Gather information on the differences in foraging ecology and nutritional needs of swans foraging on agricultural crops versus aquatic vegetation on their wintering areas. The Birds of North America (Mitchell 1994) points out the need for long-term studies of marked individuals to determine annual and lifetime reproductive success, relationships between reproduction and mate fidelity, and the differences between migratory versus sedentary life histories.

ACKNOWLEDGEMENTS

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Hiawatha National Forest; Steve Sjogren, Wildlife Biologist, Hiawatha National Forest; Betty Les, Wisconsin Natural Heritage Inventory; Sharron Nelson, Minnesota Natural Heritage and Nongame Research Program; Teresa Mackey, New York Natural Heritage Program; Carolyn Caldwell, Assistant Administrator, Wildlife Management and Research Group, Ohio.

NOMENCLATURE AND TAXONOMY

Order:	Anseriformes
Family:	Anatidae
Scientific name:	<i>Cygnus buccinator</i> (Richardson, 1831)
Subspecies:	none
Common name:	Trumpeter swan
Synonym(s):	no synonyms for common name

DESCRIPTION OF SPECIES

With a wingspan of 8 feet, a height of 4 feet, and weighing 25-35 pounds, the trumpeter swan is the largest waterfowl in North America and the largest swan in the world (USFWS 1995). Native to North America, this swan is known for its large size, long neck, short duck-like bill, and resonant trumpet-like call. The males, called cobs, and females, called pens, of this species have the same color and appearance. The adult plumage is purely white with a dense layer of down (up to 5 cm thick) which enables toleration of temperatures as low as -30°C (Red Rock 2001). Often, the head and neck are stained orange-brown due to foraging in iron-rich water (Mitchell 1994). The bill is broad and flat with serrations on the edges that allow it to strain water from aquatic vegetation (Wisconsin Department of Natural Resources 2001). The coloration of the bill appears to be entirely black from a distance, though closer inspection reveals a thin red line along the rear upper edge of the lower mandible (Mitchell 1994). The black coloration of the bill extends to the edge of the eye and forms a V-shape with the white plumage on the forehead. In addition to the bill, the short legs and feet of the adult trumpeter swan are also black in color. There are two categories of cygnets: those that hatch with “normal” plumage, and those that hatch with “leucistic” plumage. The normal plumage is dull gray, darker dorsally and nearly white ventrally. The bill is mottled pink and gray-black while the legs and feet are gray-pink. The leucistic cygnets have completely white plumage with a pale-gray wash, a completely pink bill, and yellow legs and feet. Leucistic cygnets have only been reported in Red Rock Lakes National Wildlife Refuge, Montana, at a 1.8% occurrence, and at Yellowstone National Park, Wyoming, at a 13% occurrence (Mitchell 1994). The cygnets undergo a complete prejuvenal molt that begins around 6 weeks of age and is completed around 10 weeks of age. Between 12 and 16 months of age, the bill will turn to the black adult coloration. The second year swans are mostly white with a few pale-gray or brown feathers on the head, neck, and body, and have yellowish-greenish gray to black feet and tarsi. As juveniles and adults, leucistics

will maintain yellow legs and feet and may have pale yellow or olive lores on the bill (Mitchell 1994).

The trumpeter swan call is described as deep, resonant, loud, and trumpet-like. Its call has many social functions, such as alarm, excitement, territorial display, and defense. It may call with its bill open or shut to produce slightly different sounds. In addition to the characteristic calls, it will also hiss, peep, and gurgle. The cygnets will softly 'pip' with a high-pitched tone that will deepen into the adult tone at 6-8 months of age. How vocal a swan will be depends upon its social context, with incubating or brooding swans remaining relatively quiet while non-breeding swans or wintering flocks tend to be more vocal (Mitchell 1994).

LIFE HISTORY

Trumpeter swans are mainly herbivorous, feeding on submerged and emergent aquatic vegetation, though they may include a small percentage of invertebrates in their diet. Large areas with shallow water (<1.2 m) and emergent vegetation comprise the optimal feeding habitat (USFS Species Data 1999). They have a broad diet, feeding predominately on roots, tubers, stems, leaves and seeds of a variety of aquatic vegetative species. According to Mitchell (1994), they will feed on watermeal, muskgrass, pondweeds, naiad, stonewort, milfoil, waterweed, water buttercup, watershield, bladderwort, wild celery, water parsley, manna grass, ditchgrass, eelgrass, bedstraw, horsetail, maretail, sedges, rushes, smartweed, pickerel weed, cattail, arrowleaf, wapato, bulrush, spikerush, burreed, beggartick, duckweed, waterlily/spatterdock, wild rice, mud plantain, green algae, and mosses. During the winter months they may feed on crops and grasses. In addition, in areas where they have been reintroduced, they will feed on supplemental feed of wheat, corn, and commercial poultry food when provided in the winter months (Mitchell 1994). Though the trumpeter swan prefers to forage in water, it has been observed eating blueberries, mountain cranberry, wheatgrass, brome grass, orchardgrass, ryegrass, muhly, dandelion, lupine, and skunk cabbage on land (Mitchell 1994). Cygnets feed on aquatic invertebrates, crustaceans, and vegetative fragments for the first 5 weeks, and will change to the same diet as adults by 2-3 months of age (USFWS 1995). Using visual and tactile cues, this species will choose forage above or on the surface of the water, within the water column, or on or below the lake bottom. Feeding under the surface by tipping its body vertically is most common (Mitchell 1994). To feed on submerged or emergent vegetation, the trumpeter swan will grab the plant in its strong bill and will pull or twist to break off the leaves or stems. To obtain roots and tubers, the trumpeter swan uses its large feet to make currents that loosen the surrounding mud, or to dig into the substrate to free the food. It will then tip under the water to consume the food (McKelvey 1992).

During nesting, trumpeter swans prefer to forage in water <0.3 m with more total macrophytes, muskgrass, pondweeds, and fewer spatterdock. In the winter, they prefer to forage far from the shoreline in areas with lower water velocities and higher macrophyte and tuber densities. A much higher percentage of their time is spent foraging during the winter and spring staging than during the breeding season (Mitchell 1994).

Depending on the population, trumpeter swans may migrate long distances, migrate locally, or not migrate at all (NatureServe 2001). Migration occurs at low altitudes in a

‘V’ formation, and may occur at night (Mitchell 1994). The northern populations typically must migrate to the coast or to southern reaches in order to find water that is not iced-over, while the interior populations and reestablished populations tend to be locally migrant or non-migratory, as long as open water is available (USFS Species Data 1999). Those that do migrate typically leave mid-October to late-November as the water begins to freeze and will make many intermediate stops along the migration route. First to leave the breeding grounds are single swans, sibling groups, young pairs, and failed breeders. Pairs with young will shortly follow (Mitchell 1994). In February to March, trumpeter swans will typically move to nearby fields where the snow is melting to forage and stage for the spring migration. Arrival on the breeding grounds usually occurs in April, before the ice is cleared from the water (Mitchell 1994).

Breeding pairs establish territories of 1.5 to >100 ha with both sexes defending the area either until the cygnets hatch or until the young are fully fledged. Often nest sites and territories will remain the same from year to year. Territoriality is not seen on the wintering grounds (Mitchell 1994).

Trumpeter swans are monogamous and pair for life. If a mate is killed, the remaining swan will find a new mate and will return with that new mate to the breeding ground used with the previous mate (Wisconsin Department of Natural Resources 2001). Some cobs that lose mates will not remate (Mitchell 1994). Polygamy has been observed one time in the wild and twice in captivity (Mitchell 1994). Pair bonding occurs on the wintering grounds and may occur as early as the second winter, though strong bonds are typically not formed until 3-4 years of age (Mitchell 1994). Even if bonded at 2 years, the pair will not mate until at least 3 years of age, though most pairs do not mate until 4-6 years of age (Wisconsin Department of Natural Resources 2001).

The pair will return to the same territory and typically even the same nest each year. If a pair has spent at least two summers in the same location, the attachment to that site is nearly unbreakable (Wisconsin Department of Natural Resources 2001). For a few weeks after arrival on the breeding grounds, the pair will participate in courtship displays of head-bobbing and wing-quivering (Wisconsin Department of Natural Resources 2001). Nest building may begin a few weeks before the ice melts and takes 11-35 days. Work on the nest may continue after egg-laying and during incubation (Mitchell 1994). The nests may be built on muskrat or beaver lodges, small islands, hummocks, or simply consist of floating vegetation. During nest-building, the cob will pull up vegetation and tubers and bring them to the pen who will place them into a high mound. She will then use her body to form a depression or bowl for the eggs. The final nest may be 6 feet in diameter and 1.5 feet above the water surface (Wisconsin Department of Natural Resources 2001). The pair will typically uproot any nearby vegetation, leaving an area of open water surrounding the nest to provide better visibility and lower accessibility for mammalian predators.

Egg-laying may begin as early as 6 days after nest-building began, with the pen laying one 4.5 x 3 inch off-white egg every other day until a clutch of 5-9 eggs is complete (Wisconsin Department of Natural Resources 2001). Incubation will begin before the clutch is complete, with the pen incubating the majority of the time (Mitchell 1994). The cob will aggressively defend the nest during this time and will stand guard as the female recesses a few times each day to preen, feed, and bathe (Wisconsin Department of

Natural Resources 2001). Incubation typically lasts 33-34 days. The cygnets hatch 3-36 hours apart and weigh 7 ounces (Mitchell 1994). Within 1-2 days they will leave the nest and begin feeding. By 9-10 weeks, the cygnets will be fully-feathered, and will begin to fly at approximately 15 weeks. They will take short practice flights late into September in preparation for migration. The family group will migrate to the wintering grounds together and stay as a family unit throughout the winter and return to the breeding grounds together the next spring. Upon spring arrival, the young will be shooed away, but will remain together as a sibling unit (Wisconsin Department of Natural Resources 2001). The family bond is so strong that oftentimes these sibling groups will reacquire with the parents on the wintering grounds in following winters until they begin to form their own pair bonds (Tesky 1993).

HABITAT

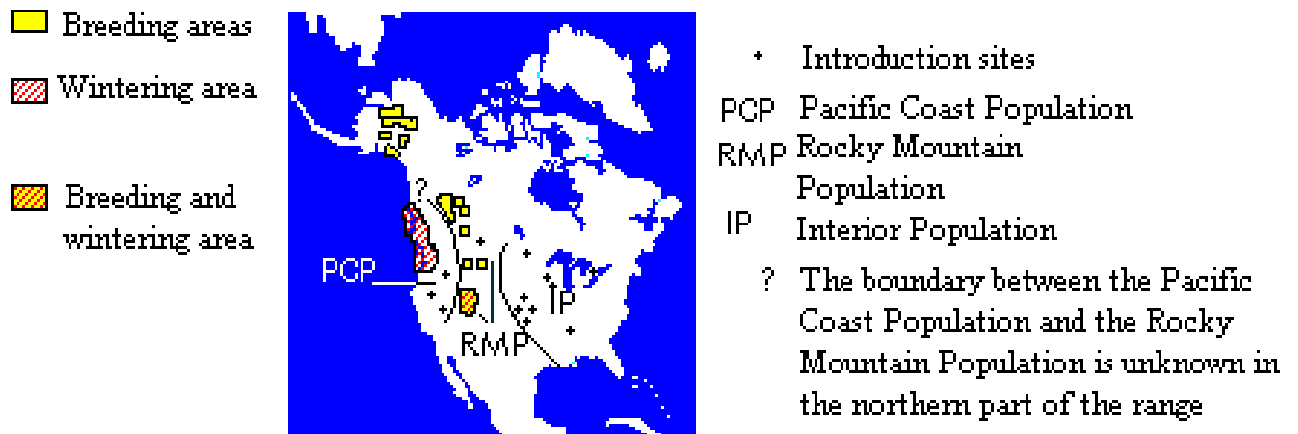
Trumpeter swans are found in riverine wetlands, lakes, ponds, marshes, or any other variety of wetlands that meet their preferences. According to Mitchell (1994), they need room for takeoff (approximately 100 m), accessible forage, shallow, stable levels of unpolluted water, emergent vegetation, muskrat houses, islands, or other structures on which to nest, and low human disturbance. They have been found to prefer and be most successful in areas with highly irregular shoreline, a depth <1.2 m, emergent vegetation, abundant and diverse aquatic vegetation communities, early ice-off, and many available nesting sites. In addition, they need more than 300 feet of open water to allow enough room for takeoff (USFS Population Viability Assessment 2000). They have been found to avoid acidic, stagnant, and eutrophic water (Mitchell 1994). Wintering populations along the coasts have been found to use tidal estuaries (USFWS 1995). Access to wetlands that are free of ice are critical in the winter habitat and have resulted in swans concentrating in such areas as the hot springs of the Yellowstone region.

DISTRIBUTION AND ABUNDANCE

Rangewide/Regionwide

Historically, the trumpeter swan bred throughout North America, from central Alaska to western Hudson Bay, southeast to Nova Scotia, and south to northwest Mississippi and eastern Arkansas, possibly as far west as California. The historical winter range was from the southeastern coast of Alaska to possibly southern California, and along the Gulf coast to central Florida and along the Atlantic coast as far as ice-free water was available (NatureServe 2001). Now, only two natural populations remain: the Pacific population that breeds in Alaska and British Columbia and winters along the Pacific coast from Alaska to northern Oregon, and the Rocky Mountain population that breeds in Alberta, British Columbia, Yukon, Northwest Territory, Saskatchewan, and the Yellowstone Region (Tesky 1993). In addition, there is the interior population of trumpeter swans east of the Rockies, consisting of individuals from reestablishment efforts that resulted in isolated populations in Michigan, Minnesota, and Wisconsin (USFWS 1995). Over 85% of the world's breeding population of trumpeter swans resides in Alaska. All other populations are discrete and localized (NatureServe 2001).

Figure 1. Distribution of the Trumpeter swan



Status

Table 1. State or Provincial and Heritage Status Rankings for the Trumpeter swan

State or Province	State or Provincial Ranking	Heritage Status Ranking*
Illinois	Not Listed	SXB,S2N
Indiana	Endangered	SRB
Michigan	Threatened	S3
Minnesota	Threatened	S2
New York	Not Listed	No ranking
Ohio	Endangered	SR
Ontario	Not At Risk	S2S3
Pennsylvania	Not Listed	SR
Wisconsin	Endangered	S1B,SZN

*Heritage Status Rankings:

- S: Subnational
- N: National
- 1: Critically imperiled
- 2: Imperiled
- 3: Vulnerable to extirpation or extinction
- 4: Apparently secure
- R: Reported
- X: Presumed extirpated
- Z: Zero occurrences
- B: Breeding range
- N: Non-breeding range

Other Statuses:

National Heritage Status Rank: United States: N4B,N4N

Canada: N2N3B,N4N

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Not at Risk

This species is believed to have been widespread and abundant throughout North America at one time but began to decline as the area was settled. By the late 1800s, the trumpeter swan was nearly brought to extinction by commercial hunters who took this bird for its meat, feathers, and skin. By the 1930s, it was believed that only 66 trumpeter swans were left in the entire species. Later, a rather large but previously-unknown population was discovered in Canada, which meant this species was not as close to extinction as first believed, but still critically imperiled. This realization initiated protection of this species and its habitat, which has led to a slow increase in its population in recent years (Michigan Department of Natural Resources Brochure).

Globally, this species is increasing in abundance with Alaskan populations seeing the greatest increases. The Rocky Mountain and Interior populations are likewise increasing, with reintroductions being responsible for most of the growth within the Interior population. Continent-wide surveys conducted since 1968 reveal that the trumpeter swan population has climbed from 3722 individuals in 1968 to 19,756 individuals in 1995 (USFS Species Data 1999). In 1998, 1,920 trumpeter swans were recorded in the Interior population with numbers for each state or province as follows: Ontario (209), Michigan (245), Wisconsin (285), Minnesota (600), Iowa (75), Ohio (36), South Dakota and Nebraska (440), and New York (15). The annual rate of increase from 1968-1998 was 0.06 over the entire range and 0.12 for the Interior population (USFS Species Data 1999). In 2001, the interior population was numbered at 2,512 individuals (Minnesota Department of Natural Resources 2001), with 401 birds in Michigan as of Fall 2000 (MSU 2001).

In an 11-year summary of the West Unit Breeding Bird Survey on the Hiawatha National Forest (Geboy 2000), it was found that the trumpeter swan was on an increasing trend with the highest relative abundance being seen in 1999.

A Trumpeter swan reintroduction program on Seney National Wildlife Refuge is part of a major effort to increase the Interior Population of trumpeter swans in North America. The refuge is an ideal habitat for trumpeter swans because it contains 7,000 acres of manageable, open, shallow water; abundant submergent vegetation for food; no power lines; and no lead shot. Forty-two swans were released on the refuge during 1991-93. In a 1999 survey of Seney National Wildlife Refuge in Seney, Michigan, it was found that 13 of 14 nests on the refuge produced young with a total of 64 hatched and 44 (69%) fledged. It was estimated that around 80 adult swans used the refuge in 1999 (Urbanek 1999). In 2000, 18 breeding pairs were successfully in raising a total of 65 cygnets to flight (Mike Tansy pers. comm. 2001). In 2001 151 adult birds hatched 76 and fledged 29 cygnets (Seney National Wildlife Refuge 2002)

POPULATION BIOLOGY AND VIABILITY

The trumpeter swan typically breeds for the first time at approximately 4-5 years of age and typically has one brood per year with an average of 4-6 eggs (NatureServe 2001). Annual reproductive success, nest success, fledgling rates, and adult and cygnet survival rates are highly variable for this species. It has been estimated that annual reproductive success ranges from 0-4.0 and survival rates are approximately 46% from laying to hatching, 48-78% from hatching to fledging, 40-100% for 1-2 year olds, and 80-100% for birds over 2 years of age (Mitchell 1994). The maximum lifespan recorded for a captive

bird was 32.5 years, while some birds in the wild have been recaptured at the age of 24 years (USFS Species Data 1999). According to The Birds of North America (1994), this combination of delayed maturation, single broods, highly variable production, and the addition of high winter mortality make population growth of the trumpeter swan slow.

POTENTIAL THREATS AND MONITORING

Present or Threatened Risks to Habitat or Range

Habitat within the breeding range of the trumpeter swan does not appear to be a limiting factor to population growth. Though this habitat appears to be secure with the swans able to colonize new areas, there may be local problems where human disturbance exists (Mitchell 1994). The greatest threat facing this species is that of winter habitat quality and availability. Development of shoreline, increased recreation uses, and draining or filling of wetlands have decreased the amount of winter habitat available. In addition, most restored populations have not established migration practices. These factors result in increased densities of swans in one area, making the populations vulnerable to one-time catastrophic events and overcrowding effects including the potential for spread of disease (Mitchell 1994). Programs increasing public awareness, the Wetland Protection Act, and implementation of the North American Waterfowl Management Plan have aided in this problem, as well as efforts to encourage the reestablishment of migration in restored populations. Long-term success of restoration programs depends upon the swans finding new wintering grounds (USFS Species Data 1999).

Table 2. Threats or Risks to the Trumpeter swan and its Habitat by Forest

Forest	Threat or Risk
Chequamegon-Nicolet	Greatest threat is human disturbance
Chippewa	No immediate threats, there is plenty of suitable habitat available at this time
Hiawatha	The biggest problem is from humans feeding the swans; they are becoming acclimated to the feedings and humans; disturbance from recreational activities
Huron-Manistee	Human disturbance from boats and jet skis; possible competition from Mute swans on Manistee District
Ottawa	Lead poisoning due to ingestion of lead shot or lead fishing sinkers (at lease one released swan lost to this); direct human-caused mortality or harassment (illegal shooting). Other concerns include artificial feeding of swans by people, which could cause the swans to lose their fear of humans and become dependant on artificial food sources.
Superior	Not on RF Sensitive Species list for the Superior NF

Commercial, Recreational, Scientific or Educational Overutilization

Trumpeter swans are very sensitive to human disturbance on their nesting grounds and will abandon nests or cygnets if disturbed too much. They are most sensitive from mid-April through mid-June, and will not nest in areas highly-developed for recreation (Tesky 1993). Aircraft overflights and flowing vehicle traffic have been found to have minimal impact while birdwatching, photography, boating, floatplanes, and the sound or sight of pedestrians have detrimental impacts. Disturbance on the wintering grounds can result in less foraging by the birds and therefore reduced reproductive potential for the following breeding season (USFS Species Data 1999). In some areas, it has been reported that humans' feeding the swans has become a problem as the birds become acclimated to the feedings and the humans (Kevin Doran pers. comm. 2001).

Disease or Predation

Predation is not considered a major threat to adult trumpeter swans as they have few natural predators aside from man. Those known include the golden eagle, bobcat, red fox, and coyote. Of much greater consequence are the egg predators (the common raven, raccoon, wolverine, black bear, brown bear, coyote, gray wolf, and river otter) and the predators of cygnets < 4 months of age (the snapping turtle, gulls, great horned owl, common raven, mink, river otter, and raccoon) (Mitchell 1994). Such predators may have a significant impact on the number of cygnets surviving to fledge. It has been suggested that the predation by snapping turtles on cygnets is significant to the point that restoration projects may be limited in some states such as Michigan (USFS Species Data 1999).

Trumpeter swans are susceptible to multiple diseases and parasites including: avian cholera, avian tuberculosis, bumblefoot, *Pseudomonas* spp., *Escherichia coli*, *Enterobacter klebsiella*, aspergillosis, avian pox, coccidiosis, hematozoans, platyhelminths, nematodes, acanthocephala, trematodes, cestodes, and leeches (Mitchell 1994). When the trumpeter swan population was brought to near extinction in the early 1900s, important information pertaining to the wintering habitat requirements and migratory routes of this species was lost. Reintroduced and reestablished populations have not restored the historical migrations that were once commonplace. As a result of this and loss of habitat, these birds are forced into small areas during winter months where disease outbreaks constitute a major threat and where one catastrophic event may wipe out a large portion of the population (Tesky 1993).

Other Natural or Human Factors Affecting Continued Existence of Species

Lead poisoning constitutes a major threat to this species due to the habitat type and foraging behavior. With the banning of lead shot use in the 1990s in Canada and the United States, the situation will likely not get worse, but will remain to be a problem as the shot will not deteriorate for many years. In addition to lead shot, trumpeter swans in parts of Alaska are poisoned from White Phosphorous that was used in military operations (NatureServe 2001).

The Migratory Bird Treaty Act of 1918 prohibited shooting of trumpeter swans, but unintentional and malicious shooting persists to the point of being a problem in some areas. Between 1980 and 1987, shooting was the number one mortality factor for trumpeter swans in the state of Minnesota. This problem can be resolved with intensified law enforcement and increased hunter education programs to teach discernment between trumpeter swans and other waterfowl species (USFS Species Data 1999).

This species, as with other large waterfowl species, migrates at low altitudes and is therefore in danger of collision with powerlines. This has become a major problem in some areas, especially in places where powerlines cross wetlands along migratory routes. The effects of this threat can be decreased with the addition of markers on the lines to increase visibility and by restricting the placement of new powerlines (Mitchell 1994).

Competition with non-native mute swans for nesting locations has been documented and may be a threat in areas where there are large concentrations of mute swans. In addition, unfavorable environmental conditions, such as cold temperatures, increased precipitation during the first two weeks after hatching, and flooding of the nest may increase juvenile mortality. Ice build-up on the collars of tagged birds, especially on cygnets, has also been noted (Mitchell 1994).

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

Table 3. Number of Occurrences of the Trumpeter swan and Land Ownership by National Forest

Forest	Number of Occurrences	County	Land Ownership	Comments
Chequamegon-Nicolet	1 pair multiple pairs	Price Forest Oneida Vilas	FS (CNF) FS (NNF)	(Norm Weiland pers. comm. 2001)
Chippewa	2-3 nesting pairs		FS	(Al Williamson pers. comm. 2001)
Hiawatha*	2 5 6 2 8 15 1 2 1 4 1 1	Alger Schoolcraft Delta Mackinac	FS	Coniferous Habitat Deciduous Habitat Farmland Mixed Deciduous/Coniferous Upland Open Habitat Lake Superior Shoreline Opening Mixed Deciduous/Coniferous Wetland Beech/Birch Habitat Mixed Deciduous/Coniferous McClouds Pond
Huron-Manistee	Approximately 5 nesting pair	Alcona Iosco Oscoda	FS	
Ottawa	4 (1998) 4 (2000) 10 (1999) 2 (1999) 4 (2000)	Baraga and Houghton Gogebic Iron	FS	Prickett Flowage (this impoundment in both counties) Sucker Lake (4); Presque Isle Flowage (6) Lake St. Kathryn (1999); Mallard Lake (2000) (Bob Johnson pers. comm. 2001)

Superior	Not a RFSS on this Forest. There are occurrences on the forest (pers. comm. Lindquist 2001), but breeding has not been confirmed (USFS Species Data 1999)			Refer to the county occurrence listing in Table 4.
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*Data for 1997 (Kevin Doran pers. comm. 2001)

Table 4. Trumpeter swan Occurrences in the Great Lake States by State, County, and Year

State	County	Number of Occurrences and Year	Comments
Illinois			
Indiana*			Trumpeter swan is reported as breeding in the state, but is not tracked
Michigan	Oscoda* Iron** Gogebic Baraga/Houghton (Prickett Flowage Impoundment) Schoolcraft Alger Delta Schoolcraft Mackinac	1 occurrence: 1996 6 occurrences: 1999(2), 2000(4) 10 occurrences: 1999 8 occurrences: 1998(4), 2000(4) 194 occurrences: 2000 38 occurrences: 1997 1 occurrence: 1997 8 occurrences: 1997 1 occurrence: 2001	Per MNFI Per Bob Johnson Per Mike Tansy Per Kevin Doran Per Steve Sjogren
Minnesota*			Trumpeter Swan is not tracked in this state
New York*			Trumpeter Swan is not tracked in this state
Ohio*	Ashland Erie Holmes Lucas Marion Muskingom Ottawa		

	Richland Sandusky Trumbull Wayne Wyandot		
Ontario			
Pennsylvania			
Wisconsin*	Adams Ashland Bayfield Burnett Douglas Iron Jackson Juneau Polk Wood	1 occurrence: 1999 1 occurrence: 1999 1 occurrence: 1999 4 occurrences: 1999 1 occurrence: 1999 1 occurrence: 1998 1 occurrence: 1998 3 occurrences: 1999 4 occurrences: 1998, 1999(3) 4 occurrences: 1997, 1999(3)	

* Information provided by: Indiana Natural Heritage Data Center, 2001; MNFI Natural Heritage Biological and Conservation Datasystem, 2001; Wisconsin Natural Heritage Datasystem, 2001; Minnesota Natural Heritage and Nongame Research Program, 2001; New York Natural Heritage Program, 2001; Ohio Wildlife Management and Research Group, 2001.

**Information provided by Bob Johnson (pers. comm. 2001)

SUMMARY OF EXISTING MANAGEMENT ACTIVITIES

In the early 1930s it was believed that less than 70 trumpeter swans remained in the world, all of which resided in the mountain valleys of Montana, Idaho, and Wyoming. As a result, the Red Rock Lakes National Wildlife Refuge was set up in Montana to protect the remaining Trumpeters and attempt to increase their population and preserve their habitat (Hansen 1973). This marked the beginning of what would be a very long and extensive tale of management for the trumpeter swan.

In the 1930-1940s, management consisted of protection from shooting, winterfeeding, and translocation of birds to other breeding locations. Many of these efforts continue today, but the emphasis has shifted to restoration of populations to the midwestern region. Other management activities include management of human recreation, attempts to decrease pollution such as lead, increasing winter distribution, and improving winter and breeding habitat (Mitchell 1994). To increase winter distribution, projects of capturing and relocating birds have been implemented. Attempts to reestablish migration routes have also been implemented by using such practices as hazing birds in hopes of encouraging them to fly further south. To improve habitat, practices have been implemented to provide stable water levels (to ensure adequate aquatic plant production and to prevent nest flooding), establish instream flow agents, and reduce human disturbance (Mitchell 1994).

Management recommendations for nesting areas where human disturbance is present entail that sources of loud noises be restricted during breeding season, that human activity is discouraged, and that wildlife viewing areas are placed >300 m away from the nest to

cut down on noise and visibility of humans (NatureServe 2001). When a forest harvest is planned near a trumpeter swan breeding area, it is recommended that the harvest occur in the winter and that an adequate buffer zone be left around the wetland (USFS Species Data 1999).

In agricultural regions, trumpeter swans can be beneficial when they clean harvested fields of waste produce, which prevents unwanted volunteer crops and disease and pest outbreaks. However, the swans can also be a detriment by creating large craters in flooded fields while foraging, permanently damaging grass crop fields by overgrazing and uprooting, and by compacting the soil. For these reasons, trumpeter swans have been seen as a nuisance in such places as British Columbia. To work toward a solution to this problem in British Columbia, the Canadian Wildlife Service, Ducks Unlimited of Canada, Ministry of Agriculture, Fisheries, and Food, and local farmers have joined in a cooperative management program since 1991. Under this program, the behavior of the swans is monitored, winter crop cover such as rye grasses is planted to lure the swans from prized crops, and hazing programs to discourage unwanted foraging have been developed (Trumpeter swan Sentinel Society 2000).

PAST AND CURRENT CONSERVATION ACTIVITIES

Major recovery efforts have been carried out in Minnesota, Wisconsin, Michigan and Ontario with the result of steadily increasing populations in those areas. Trumpeter swan recovery was pioneered in Minnesota's Hennepin Parks in 1966 with the release of a pair of swans from the Red Rock Lakes Wildlife Refuge. The result of this and further reintroductions in subsequent years was the hatching of one cygnet in 1969, the first one documented since the 1880s (Hansen 1973). Minnesota Department of Natural Resources began its recovery program in 1982 with the goal of establishing a minimum nesting population of 15 pair in the western region of the state (Wisconsin Department of Natural Resources 2001). The goal has since been achieved and the state has begun an attempt to establish populations in the southern region of the state. Since 1987, approximately 300 swans have been released with a natural population of greater than 914 swans established (Minnesota Department of Natural Resources 2001). In 1999, 50 pair nested with a total of 200 young fledged (USFS Species Data 1999).

The trumpeter swan recovery program in Michigan was undertaken by the Michigan Department of Natural Resources in 1986 with the goal of attaining 3 populations with a total of 200 swans by the year 2000. The program began with the practice of cross-fostering a total of 44 trumpeter swan eggs with Mute swan parents from 1986 to 1988, but when only 6 cygnets fledged of the 31 that hatched, the practice was discontinued. In its place, the DNR began to release 2-year-old birds that had been raised in captivity. Between the years of 1989 and 1994, a total of 134 swans were released across the state (Wisconsin Department of Natural Resources 2001). A 1998 survey revealed that the goal of 200 swans for Michigan had been exceeded (USFS Species Data 1999).

Wisconsin Department of Natural Resources began its trumpeter swan recovery program in 1987 with the same practice of cross-fostering that was being used in Michigan. With 35 eggs placed and only 2 cygnets fledging of the 26 that hatched, the Wisconsin DNR also decided to discontinue the practice and instead release cygnets in the wild. The goal of the Wisconsin program was to attain at least 20 breeding and migratory pairs of

trumpeter swans by 2000 (Wisconsin Department of Natural Resources 2001). As of 1999, 30 pair were documented in the state with a total of 80 young, 60-70 of which survived to fledge (USFS Species Data 1999).

According to Bob Johnson (pers. comm. 2001), prior to the year 1998 there were no documented occurrences of trumpeter swans on Michigan's Ottawa National Forest (ONF). Starting in 1998, the ONF became a partner of the Keweenaw Bay Indian Community in a trumpeter swan reintroduction program for the western Upper Peninsula. The ONF portion of the partnership included locating release sites on the forest and monitoring the released swans. It was a three-year project (1998, 1999, and 2000) during which 33 juvenile trumpeter swans were released in the western Upper Peninsula (Mike Donofrio pers. comm. 2001). A total of 24 swans were released on the ONF in Baraga, Gogebic, Houghton, and Iron counties. During the 2000 breeding season, two of the released females were known to breed, though the location of the breeding was not known and likely not in the western U.P. In 2001, the locations of 10 of the released swans were known, with the possibility of one actively breeding pair on Prickett Dam. Approximately half of the swans released in the western Upper Peninsula are known to winter in Wisconsin, while some of the remaining winter in Illinois, Arkansas, Missouri, and eastern Iowa (Mike Donofrio pers. comm. 2001).

The Huron-Manistee National Forest was also involved in a reintroduction effort in cooperation with the Michigan Department of Natural Resources in the years of 1995 (12 birds released), 1998 (10 birds released), and 1999 (10 birds released). Some of the birds were released on forest lands while others were released elsewhere. In the past, as many as 5 pair of trumpeter swans have been observed breeding on the forest, though there are no confirmed reports for the year 2001. It is believed that these birds are thriving and will continue to do so in the future (Kenneth (Rex) Ennis pers. comm. 2001).

The Hiawatha National Forest also participated in a reintroduction program in 1991 with the release of 6 juvenile swans on Grassy Lake in Schoolcraft County (Kevin Doran pers. comm. 2001). The criteria used when choosing a release site entailed that there must be a low incidence of lead shot, ≥ 40 acres of open water, no mute swans, heavy submerged aquatic vegetation, no powerlines, and low human activity (Decision Memo 1993). Since the time of the reintroduction, the swans have done exceedingly well. Inhabiting nearly every available habitat on the forest, the swans are no longer directly monitored and there is not an estimate for the number of breeding pairs for the year 2001 (Kevin Doran pers. comm. 2001).

RESEARCH AND MONITORING

Existing Surveys, Monitoring, and Research

In larger populations, it is useful to survey populations in late summer to count pairs of birds with broods. In smaller populations, the swans are typically surveyed in May or June with counts of all pairs recorded. The danger, however, is that not all pairs of trumpeter swans are breeding pairs, so a simple count of only pairs of birds will not give an accurate idea of productivity of the population. With trumpeter swans being long-lived, productivity problems would not be detected for a long period of time if only adults

were being surveyed. Due to this, the current push is for surveys to be conducted in the late summer with counts of pairs of birds with broods (NatureServe 2001).

Research Priorities

NatureServe (2001) outlined three major research needs: 1) to gather information on gene flow between populations; 2) determine nutritional requirements of different age and sex classes as well as determine the differences in foraging ecology and nutritional needs between migratory and sedentary populations; and 3) gather information on the differences in foraging ecology and nutritional needs of swans foraging on agricultural crops versus aquatic vegetation on their wintering areas. The Birds of North America (Mitchell 1994) points out the need for long-term studies of marked individuals to determine annual and lifetime reproductive success, relationships between reproduction and mate fidelity, and the differences between migratory versus sedentary life histories.

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APPENDIX

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